EFFICIENT INTERROGATION OF UNCERTAINTY SPACE FOR ENHANCING MODEL ROBUSTNESS

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ABSTRACT

This paper is concerned with exploiting simple uncertainty analysis techniques to develop computationally efficient methods for investigating robustness of models in the face of parametric uncertainties. The framework of the approach is based upon the Ben-Haim's theory of information-gap, which models the clustering of uncertain events as families of nested sets. One of the current limitations with the information-gap approach relates to the necessity of investigating all uncertain events within these sets: this may be prohibitively time-consuming for even relatively simple models. In this paper, methods developed from the interval and affine arithmetic approaches to global optimization will be employed to return guaranteed bounds relating to the robustness of a particular model to uncertainty. The nonlinear system under investigation is the propagation of a transient impact through a layer of hyper-elastic material. Uncertainty is present not only in the model parameters but in the actual form of the model itself.